

ROOFING APPLICATION STANDARD (RAS) No. 117
STANDARD REQUIREMENTS FOR BONDING OR MECHANICAL ATTACHMENT OF
INSULATION PANELS AND MECHANICAL ATTACHMENT OF ANCHOR AND/OR
BASE SHEETS TO SUBSTRATES

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| 1. | Scope | Minimum withdrawal resistance for insulation fasteners shall be 275 lbf. |
| 1.1 | The standards set forth herein provide a means of determining proper attachment of anchor and/or base sheets and insulation panels. | 3.3 For recover or reroof applications over an existing steel deck, having a thickness less than 22 gage, insulation fasteners shall be tested for withdrawal resistance in compliance with TAS 105. |
| 1.2 | All testing shall be conducted by an approved testing agency. A Professional Engineer, or Registered Architect, shall sign and seal all calculations. | 3.4 Insulation fasteners and stress plates, and minimum acceptable insulation panel size and thickness shall be as listed in the roof assembly Product Approval. |
| 2. | Anchor and Base Sheets, General | 3.5 Installation of more than one insulation layer using a single fastener shall utilize the fastening pattern and fastener designated for the top insulation panel. |
| 2.1 | All damaged stress plates shall be removed and replaced. | 3.6 Mixing of insulation panels (e.g., different manufacturer's, insulation types) shall not be acceptable when applied in the same layer. |
| 2.2 | Insulation shall only be attached with approved insulation fasteners. | 3.7 Only as much insulation as can be roofed shall be installed each working day. Water shall not be allowed to run in the flutes of steel deck ribs under completed roof sections. |
| 3. | Insulation, General | 3.8 Insulation panels shall be installed with minimum joint dimensions and shall be tightly butted. Maximum joint widths shall be $\frac{3}{8}$ in. |
| 3.1 | All insulation fasteners shall be installed in compliance with the fastener manufacturer's published installation instructions and the limitations set forth in the Product Approval. Insulation attachment for panels in the field area of the roof shall use a fastener spacing in compliance with Figures 1 through 4 of this Application Standard, as referenced in the Roof Assembly Product Approval. Fastener placement guidelines shall be as follows: | 3.9 All insulation joints shall be staggered. Tapered insulation shall be installed in accordance with manufacturer's recommendations. |
| | <ul style="list-style-type: none"> • Fasteners installed at insulation panel edges shall be spaced not greater than $13\frac{1}{2}$ inches nor less than $4\frac{1}{2}$ inches from the edge of the panel. • Fasteners shall be evenly distributed over the panel area. | 3.10 Tapered insulation may be substituted for any flat stock type listed in the Roof System Assembly Product Approval. The fastening requirements shall remain the same. Polyisocyanurate tapered insulation systems shall have a minimum average thickness per panel of 1 in. |
| 3.2 | All insulation fasteners and stress plates shall be tested in compliance with Chapter 15 (High-Velocity Hurricane Zone) of the <i>Florida Building Code, Building</i> . | |

- 3.11 Insulation pieces that are cut from larger panels and are smaller than one square foot shall not be acceptable.
- 3.12 All insulated decks containing interior drains shall be sumped at the drains. Sump area insulation shall be tapered at a minimum slope of $\frac{1}{8}$ of an inch per foot to the drain. The drain sump area shall be a minimum of (24 in. by 24 in.) 576 square inches, unless restricted by a wall or any other obstruction.
- 3.13 All overdriven fasteners or fasteners driven at an angle, shall be removed and replaced. If the insulation facer has been broken by a stress plate, that section of insulation panel shall be removed and replaced.
- 3.14 Attachment of any low density insulation panel, fiberglass or mineral wool, shall be with self-locking fasteners.
- 3.15 Insulation fasteners and stress plates shall be installed with tooling specified by the fastener manufacturer.
- 3.16 Predrilling, if any, shall be with the diameter bit listed in the withdrawal resistance test report. The drill bit tolerance range noted in the test report shall be maintained throughout the project. Should a change in bit size be required due to varying density of the deck material, an additional withdrawal resistance test shall be conducted to confirm fastener performance. Drill holes shall not spalled.
- 3.17 When installing “hammer-in” concrete fasteners, all deformed stress plates shall be removed and replaced.
- 3.18 Concrete dust shall be removed by brushing or forced air from the insulation top surface prior to the application of hot asphalt or adhesive.
- 3.19 Roof insulation and roll goods, either on the ground or on the roof top, shall be kept dry. The building official shall instruct the removal of the insulation or roll goods from the job when elevated moisture levels are found.

4. Insulation Attachment Over Steel Decks

- 4.1 Steel deck insulation fasteners shall penetrate the top flange of a steel deck not less than $\frac{1}{2}$ in.
- 4.2 The two opposite edges of any insulation panel shall be supported on the top flanges of the steel deck, and shall have a minimum bearing width of $1\frac{1}{2}$ in. unless restricted by top flange width. Alternatively, minimum 22 gage galvanized or painted sheet steel may be placed over the deck ribs and secured with minimum #12 diameter fasteners spaced 18 in. o.c. (see Figure 5).
- 4.3 Steel deck sections shall properly “nest,” allowing insulation panels to have full contact with the top flanges. If any deck sections do not “nest” properly, the sections shall be repaired prior to the application of the roof insulation. Cutting, scoring or hollowing of the insulation panels is not acceptable.

5. Insulation Attachment Over Concrete Decks

- 5.1 Threaded concrete fasteners shall be a minimum of a #14 diameter. “Hammer-in” concrete fasteners having a length less than or equal to 8 in. shall have a minimum diameter of $\frac{3}{16}$ in. “Hammer-in” concrete fasten-

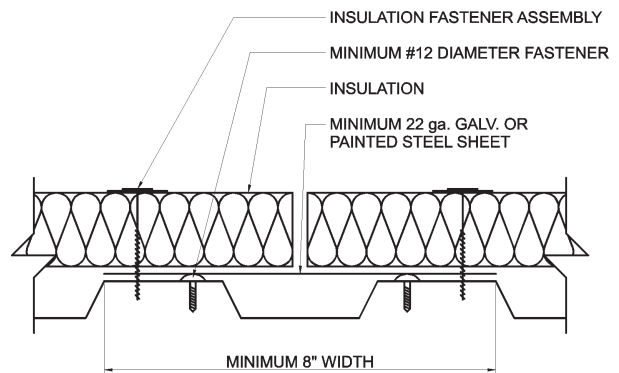


FIGURE 5
USE OF STEEL SHEET TO ENSURE SUPPORT OF
INSULATION PANEL GAGES

ers having a length in excess of 8 in. shall have a minimum diameter of $1\frac{1}{4}$ in.

- 5.2 Insulation fasteners shall penetrate the concrete deck a minimum of $1\frac{1}{4}$ in.

6. Lightweight Insulating Concrete

- 6.1 New pours of lightweight insulating concrete shall be tested for fastener withdrawal in compliance with Section 1917 of the *Florida Building Code, Building*.

- 6.2 Rigid roof insulation panels shall not be applied directly over lightweight concrete decks.

- 6.3 For recover or reroof applications where the proposed mechanical attachment is through the lightweight insulating concrete and to the structural deck, a TAS 105 withdrawal resistance test of the proposed fastener shall be conducted. Calculations based on the TAS 105 shall be submitted to the building official for evaluation of the proposed fastening method.

7. Wood Decks

- 7.1 Approved insulation fasteners shall be used for insulation attachment to wood decks. Nails are not acceptable for insulation attachment.

8. Perimeter, and Corner Roof Areas

- 8.1 The roofing assembly Product Approval shall list the maximum design pressure for the accepted assembly. Such pressure shall be applicable to the field of the roof area (1) as defined in ASCE 7. Should the roof assembly Product Approval allow extrapolation to perimeter and corners areas (2 and 3) as defined in ASCE 7, the following shall apply.

- The maximum extrapolation shall not be greater than 280 percent except as noted in Section 9.2.
- The minimum fastener separation shall not be less than 4 in. o.c.

- If the perimeter and/or corner areas of the roof have calculated design pressures which are less than or equal to the maximum design pressures noted in the roof assembly Product Approval, then specified anchor/base sheet or insulation attachment shall also apply in these areas.
- If the minimum design pressure exceeds the roof assembly maximum design pressure such roofing system may be granted a one-time approval by the authority having jurisdiction, provided the applicant demonstrates, by testing and/or rational-analysis that such roofing system complies with the provision of the *Florida Building Code*.

- 8.1.1 In recover or reroof applications, if testing in compliance with TAS 105 of the insulation fasteners results in a minimum characteristic resistance force less than 275 lbf (1224 N), a Professional Engineer, or Registered Architect shall perform a moisture survey, in compliance with TAS 126, and examine the deck's integrity. The moisture survey and examination results, along with the withdrawal resistance test results and a proposed deck repair/replacement specification, shall be submitted to the building official for review prior to issuance of a roofing permit.

Subsequent to repair or replacement of the deck, a withdrawal resistance of the fasteners shall be conducted. The same criteria noted above shall apply.

- 8.2 As an alternate to data extrapolation, or in the event data extrapolation is not allowed, in-situ (on-site) field uplift resistance testing of the in place roof assembly may be conducted in elevated pressure zones to confirm uplift resistance performance. Testing shall be conducted in compliance with TAS 124. Such Field uplift resistance testing shall be conducted to 1.45 times the design pressure for the tested pressure zone, and submitted to the building official for review.

9. Insulation Attachment — New Construction/Reroof Application

9.1 Example of Data Extrapolation:

9.1.1 Given:

A building having a roof mean height less than 60 feet where the design pressures are as follows:

Field Area: - 43.0 psf
Perimeter Area: - 56.0 psf
Corner Areas: - 90.0 psf

Consider a Roof Assembly Product Approval, which includes a system having an accepted maximum design pressure of -45 pound per square foot (2155 Pa). The Product Approval specifies 4-ft by 4-ft insulation panels attached with four fasteners per panel.

9.1.2 Determine the required number of fasteners per insulation panel to meet the design pressures in the elevated pressure zones.

General Equation:

$$\left(\frac{\text{known \# of fasteners}}{\text{max. design pressure}} \right) = \left(\frac{\text{unknown \# of fasteners}}{\text{elevated design pressure}} \right)$$

Perimeter Area:

$$\left(\frac{4 \text{ fasteners}}{45 \text{ psf}} \right) = \left(\frac{X \text{ fasteners}}{56 \text{ psf}} \right) \quad \text{Ø } X = 4.9 \text{ fasteners}$$

All fractions shall be rounded up to the next whole number. Therefore, the perimeter insulation panels

shall be fastened with five fasteners per 4-ft by 4-ft panel. Fastener locations shall be in compliance with Figure 3, herein.

Corner Areas:

$$\left(\frac{4 \text{ fasteners}}{45 \text{ psf}} \right) = \left(\frac{X \text{ fasteners}}{90 \text{ psf}} \right) \quad \text{Ø } X = 8 \text{ fasteners}$$

Therefore, corner panels shall be attached with eight fasteners per 4-ft by 4-ft panel. Fastener locations shall be in compliance with Figure 3, herein.

9.2 If the data extrapolation results in a number of fasteners for an elevated pressure zone which exceeds 280 percent of that for the field area, additional testing, as determined by the building official, may be required to confirm the performance of the Roof System Assembly.

9.3 If an insulation panel overlaps into an elevated pressure zone (i.e. field area insulation panel overlapping into the perimeter or corner area of the roof, or a perimeter area insulation panel overlapping into the corner area of the roof), the more stringent fastener density shall apply to the entire overlapping panel.

9.4 For multilayer insulation systems, the fastener density specified for the top panel shall be used. If the top layer is bonded in hot asphalt, the fastener density of the base insulation layer shall be used.

9.5 Alternatively, the base sheet of an approved roof assembly may be mechanically attached with insulation fasteners and plates through the insulation panels to

TABLE 1 SQUARE FEET PER FASTENER FOR COMMON ANCHOR/BASE SHEET ATTACHMENT PATTERNS		
Field Area Attachment Pattern From Roof Assembly Product Approval		Square Feet per Fastener
Side Lap Row	Center Row(s)	
7 1/2 in. o.c.	one row, 7 1/2 in. o.c.	0.83
9 in. o.c.	two staggered rows, 12 in. o.c.	0.80
9 in. o.c.	two staggered rows, 18 in. o.c.	1.00
12 in. o.c.	two staggered rows, 12 in. o.c.	0.89
12 in. o.c.	two staggered rows, 18 in. o.c.	1.14
12 in. o.c.	two staggered rows, 24 in. o.c.	1.33

the structural deck to increase the uplift performance of the roof assembly. Base sheet fastener spacing shall be as listed in roof assembly Product Approval, or may be determined in compliance with Section 10, herein.

- 9.6 For buildings of mean roof height greater than 60 feet the example above shall also apply.

10. Anchor or Base Sheet Attachment – New Construction/Reroof Applications

- 10.1 This section covers determination of anchor/base sheet fastener applications. Anchor/base sheet attachment for elevated pressure zones may be determined through extrapolation of the data for field area attachment. Data extrapolation outlined in Section 10.4.4 utilizes field area attachment data currently found in roof assembly Product Approval.

- For steel deck applications, fastener spacing shall be in increments of 6 in. o.c.

- 10.2 The following calculations have been performed for several common anchor/base sheet attachment patterns, the results of which are noted in Table 1 of this Roofing Application Standard. The values listed in Table 1 apply solely to anchor/base sheets having a width less than or equal to 36 inches and applications having a side lap equal to or greater than 4 in.

- 10.3 If the field area attachment pattern from the roof assembly Product Approval is not listed in Table 1, or the anchor/base sheet has a width in excess of 36 inches, or the side lap is less than 4 in. wide, then the following calculations shall be conducted to determine the number of square feet per fastener.

10. Example of Data Extrapolation:

- 10.4.1 Given:

A building having a concrete deck and a roof mean height less than 60 feet where the design pressures are as follows:

Field Area: - 43.0 psf
Perimeter Area: - 56.0 psf
Corner Areas: - 90.0 psf

Consider a roof assembly Product Approval, which includes a system having a maximum design pressure of -45 psf (2155 Pa). The Product Approval specifies an anchor/base sheet, having a width of 36 in. attached with approved fasteners and bearing plates at a spacing of 12 in. o.c. at a 4 in. side lap and two rows staggered in the center of the sheet, 24 in. o.c.

- 10.4.2 Determine the number of square feet per fastener.

To determine the number of square feet per fastener, first determine the length of anchor/base sheet, which will yield one net square (i.e., 100 ft.²)

Net Width of Sheet (ft):

$$\text{Net Width (ft)} = \frac{(\text{Sheet Width}) - (\text{Side Lap Width})}{12}$$

$$\text{Net Width (ft)} = \frac{(36 \text{ in}) - (4 \text{ in})}{12} = 2.67 \text{ feet}$$

Net Length to Make One Square (100 ft²):

$$\text{Net Length} = \frac{(100 \text{ ft}^2)}{\text{Net Width}}$$

$$\text{Net Length} = \frac{(100 \text{ ft}^2)}{(2.67 \text{ ft})} = 37.5 \text{ ft}$$

Determine the total number of fasteners per square.

General Equation:

$$\left(\frac{1 \text{ fastener}}{A} \right) \times \left(\frac{12 \text{ in.}}{\text{ft.}} \right) \times \left(\frac{B}{\text{row}} \right) \times \left(\frac{C}{\text{square}} \right) = D$$

where: A = specified fastener spacing (inches);
 B = net length (in feet) to make one square;
 C = number of rows having spacing (A); and,
 D = number of fasteners per square.

Side Lap Row:

$$\left(\frac{1 \text{ fastener}}{12 \text{ in}}\right) \times \left(\frac{12 \text{ in}}{\text{ft}}\right) \times \left(\frac{37.5 \text{ ft}}{\text{row}}\right) \times \left(\frac{1 \text{ row}}{\text{square}}\right) = 37.5 \frac{\text{fasteners}}{\text{square}}$$

Center Rows:

$$\left(\frac{1 \text{ fastener}}{24 \text{ in}}\right) \times \left(\frac{12 \text{ in}}{\text{ft}}\right) \times \left(\frac{37.5 \text{ ft}}{\text{row}}\right) \times \left(\frac{2 \text{ rows}}{\text{square}}\right) = 37.5 \frac{\text{fasteners}}{\text{square}}$$

Combining these values leads to a total of 75 fasteners per square, which equates to 1.33 square feet per fastener, as noted below.

$$\frac{\left(\frac{100 \text{ ft}^2}{\text{square}}\right)}{\left(\frac{37.5 \text{ side lap fasteners}}{\text{square}}\right) + \left(\frac{37.5 \text{ center row(s) fasteners}}{\text{square}}\right)} = 1.33 \text{ per fastener}$$

10.4.3 Determine the “fastener value:”

General Equation:

$$f_y = (\text{max. design pressure}) \times (\text{ft}^2 \text{ per fastener})$$

$$f_y = \left(\frac{45 \text{ lbf}}{\text{ft}^2}\right) \times \left(\frac{133 \text{ ft}^2}{\text{fastener}}\right) = 60.0 \text{ lbf}$$

10.4.4 Determine anchor/base sheet fastener spacing (FS) to meet the design pressures in the elevated pressure zones of the roof.

10.4.5 **General Equation:**

$$FS = \frac{f_y \times 144}{P \times RS}$$

FS = fastener spacing (in.);
 f_y = fastener value (lbf);
 P = design pressure (psf); and
 RS = row spacing (in.);

NOTE: As noted in the above equation, the row spacing is not needed to determine the fastener spacing. The row spacing is merely the net width of the sheet divided by the number of rows. For this case, the net width is 32 in. and there are three fastener rows (i.e. one side lap row and two center rows). This leads to a row spacing of 10.7 in.

Perimeter Area:

$$FS = \frac{(60.0 \text{ lbf}) \times \left(\frac{144 \text{ in.}^2}{\text{ft.}^2}\right)}{(56.0 \text{ psf}) \times (10.7 \text{ inches})} = 14.4 \text{ inches}$$

All fractions shall be rounded down to the next whole number. Therefore, perimeter area anchor/base sheet attachment could be with three rows spaced 10.7 in. apart, 14 in. o.c. Generally, side lap fastener spacing should not exceed 12 in. o.c.

Corner Area:

$$FS = \frac{(60.0 \text{ lbf}) \times \left(\frac{144 \text{ in.}^2}{\text{ft.}^2}\right)}{(90.0 \text{ psf}) \times (10.7 \text{ inches})} = 9.0 \text{ inches}$$

Therefore, a fastener spacing of 9 in. o.c. at a 4 in. side lap and two rows staggered in the center of the sheet, 9 in. o.c. would be an acceptable corner area anchor sheet fastener spacing.

10.5 In recover applications anchor/base sheet attachment applications shall utilize approved insulation fasteners and bearing plates. Anchor or base sheet fasteners or nails shall not be utilized in such applications.

10.6 For buildings of mean roof height greater than 60 feet the example above shall also apply.

11. Architectural Appearance Applications

11.1 Design Values

11.1.1 The design value for architectural appearance applications shall be the

**TABLE 2
TYPICAL FASTENER VALUES FOR ARCHITECTURAL APPEARANCE APPLICATIONS**

Wood Deck Fastener	Substrate	Min. Penetration	Fastener Value
12 gage annular ring shank nail	Nominal 1 in. Wood Plank (i.e., $\frac{13}{16}$ in. tongue and groove)	$\frac{3}{4}$ in	32.00
#7 wood screw	Nominal 1 in. Wood Plank (i.e., $\frac{13}{16}$ in. tongue and groove)	$\frac{3}{4}$ in	45.00
#7 wood screw	Nominal $\frac{19}{32}$ in. Plywood	$\frac{7}{16}$ in	37.50

**TABLE 3
TYPICAL 'DYNAMIC PULL THROUGH VALUES' FOR ARCHITECTURAL APPEARANCE APPLICATIONS**

Anchor or Base Sheet	Bearing Plate Diameter	Dynamic Pull-Through Value (lbf)
ASTM D 226, Type II (30# Organic Felt) with hot mopped mineral surfaced roll roofing	$1\frac{5}{8}$ in	38.20
ASTM D 4601, (Fiberglass) with hot mopped mineral surfaced roll roofing	$1\frac{5}{8}$ in	49.40

lesser of either the “Fastener Value” of the fastener, determined in compliance with TAS 105 or the “dynamic pull-through value” of the anchor/base sheet over the proposed bearing plate, determined in compliance with TAS 117(B). Values shall be listed in fastener/plate manufacturer’s Product Approval.

11.1.2 Tables 2 and 3, below, list typical “Fastener Values” and “Dynamic Pull-through Values,” which may be used to determine anchor/base sheet fastener spacing in compliance with this section. Any wood deck fasteners, anchor/base sheets, which are proposed for use in an architectural appearance application and are not listed in Tables 2 and 3 shall be tested in compliance with TAS 117(A) and/or TAS 117(B) to determine necessary design values.

11.1.3 If a proposed fastener is “larger” than those noted in Table 2, the “Fastener Value” noted in Table 2 may be utilized. If a proposed bearing plate is larger than those noted in Table 3, the “Dynamic Pull-through Value” of the anchor/base over the smallest bearing plate may be utilized.

11.2 Example of Data Extrapolation:

11.2.1 Given:

A building having a roof mean height less than 60 feet where the design pressures are as follows:

Field Area: - 43.0 psf
Perimeter Area: - 56.0 psf
Corner Areas: - 90.0 psf

Consider an architectural appearance application in which an ASTM D 226, Type II base sheet, having a width of 36 in., is to be mechanically attached with a 3-in. side lap, to nominal 1-in. wood plank ($\frac{13}{16}$ -in. tongue and groove) using #8 wood screws and $1\frac{1}{8}$ -inch diameter tin caps. One ply of approved mineral surfaced roll roofing is to be applied over the mechanically attached base sheet in a full mopping of hot asphalt.

11.2.2 Determine the design value to be used in data extrapolation.

From Table 2, the “Fastener Value” for this application is 45.0 lbf. From Table 3, the “Dynamic Pull-through Value”

for this application is 38.2 lbf. Taking the lesser of the two values, the design value for this case would be 38.2 lbf.

- 11.2.3 Determine a base sheet fastener spacing (FS) to meet the design pressures in each pressure zone of the roof.

General Equation:

$$FS = \frac{(\text{design value}) \times 144}{P \times RS}$$

Note: The side lap, for this case is specified at 3 in. Therefore, the row spacing (RS) in the above noted equation shall be 11 inch [i.e., sheet width (36 inch) minus side lap width (3 inch) divided by the number of fastener rows (3)].

Field Area:

$$FS = \frac{(38.2 \text{ lbf}) \times \left(\frac{144 \text{ in}^2}{\text{ft}^2}\right)}{(40.0 \text{ psf}) \times (11 \text{ inches})} = 12.5 \text{ inches}$$

All fractions shall be rounded down to the next whole number. Therefore, a fastener spacing of 12 in. o.c. at a 3-in. side lap and two rows staggered in the center of the sheet, 12 in. o.c. would be an acceptable field area base sheet fastener spacing.

Perimeter Area:

$$FS = \frac{(38.2 \text{ lbf}) \times \left(\frac{144 \text{ in}^2}{\text{ft}^2}\right)}{(47.0 \text{ psf}) \times (11 \text{ inches})} = 10.7 \text{ inches}$$

All fractions shall be rounded down to the next whole number. Therefore, a fastener spacing of 10 in. o.c. at a 3-in. side lap and two rows staggered in the center of the sheet, 10 in. o.c. would be an acceptable perimeter area base sheet fastener spacing.

Corner Areas:

$$FS = \frac{(38.2 \text{ lbf}) \times \left(\frac{144 \text{ in}^2}{\text{ft}^2}\right)}{(55.0 \text{ psf}) \times (11 \text{ inches})} = 9.1 \text{ inches}$$

All fractions shall be rounded down to the next whole number. Therefore, a fastener spacing of 9 in. o.c. at a 3-in. side lap and two rows staggered in the center of the sheet, 9 in. o.c. would be an acceptable perimeter area base sheet fastener spacing.

12. Bitumen or Adhesive Application, General

- 12.1 Insulation panel sizes listed in the Product Approval are the minimum approved sizes and thickness. Panels up to 4 ft. by 4 ft. may be installed in hot asphalt or approved cold adhesive, as specified in roof assembly Product Approval.
- 12.2 Not less than 85 percent of each insulation panel shall be in contact with the substrate and bonded with asphalt or adhesive, unless a specific intermittent adhesive attachment pattern is detailed in the roof assembly manufacturer's Product Approval.
- 12.3 Insulation panels set in hot asphalt shall be "walked in" to ensure complete adhesion to the substrate. Multiple "walk-in" procedures may be required for foam adhesive products that expand during the curing process.
- 12.4 For recover applications where the insulation panels are to be bonded to an existing roof membrane, all loose gravel shall be completely removed and the substrate shall be fully primed with ASTM D 41 primer. For applications where the insulation panels are to be bonded to a structural concrete deck, the deck shall be fully primed with ASTM D 41 primer. Primer shall be allowed to completely dry prior to asphalt applications.
- 12.5 Approved foam adhesive applications of insulation panels shall be applied in strict compliance with the foam adhesive manufacturer's Product Approval.
- 12.6 No extrapolation for the elevated pressure zones, as defined by ASCE 7, shall be allowed in adhered roof assemblies.

- 12.6.1 Bonded roof assembly may be tested in accordance with TAS 124 to verify attachment in the elevated pressure zones. The number of tests required shall comply with this Section. A minimum of four test specimens shall be conducted on each roof level with not less than two tests being conducted in each elevated pressure zone (perimeters and corners). One additional test shall be conducted for every 25 roofing squares of the elevated pressure zone area. A 1.45:1 margin of safety shall be applied to the test results.

13. Bitumen or Adhesive Application, Structural Concrete

- 13.1 A “Deck Dryness Test” shall be performed on structural concrete decks prior to asphalt application. The following procedures are specified for testing the dryness of the roof deck.
- 13.1.1 Heat not less than one pint of the specified asphalt to 400°F. Pour into a container.
- 13.1.2 Pour the asphalt on the primed deck surface. If the asphalt foams, the deck contains too much moisture for the asphalt to bond.
- 13.1.3 After the asphalt has cooled, pull the asphalt patch from the deck surface. If the asphalt patch strips clean, the deck is not dry enough for Roof System Assembly application. Wait a further period for the deck to dry and a sufficient asphalt bond can be achieved. Repeat the test procedure.
- 13.2 Structural concrete decks shall be primed with ASTM D 41 primer and allowed to dry prior to asphalt application, as noted in Section 12.4.
- 13.3 If applied directly to the deck, insulation shall be adhered in a full mopping of hot asphalt at an application rate of between 20 and 40 pounds per square, depending on the asphalt EVT. Asphalt types and temperature ranges shall be in compliance with Chapter 15 (High-Velocity Hurricane Zones) of the *Florida Building Code, Building*.

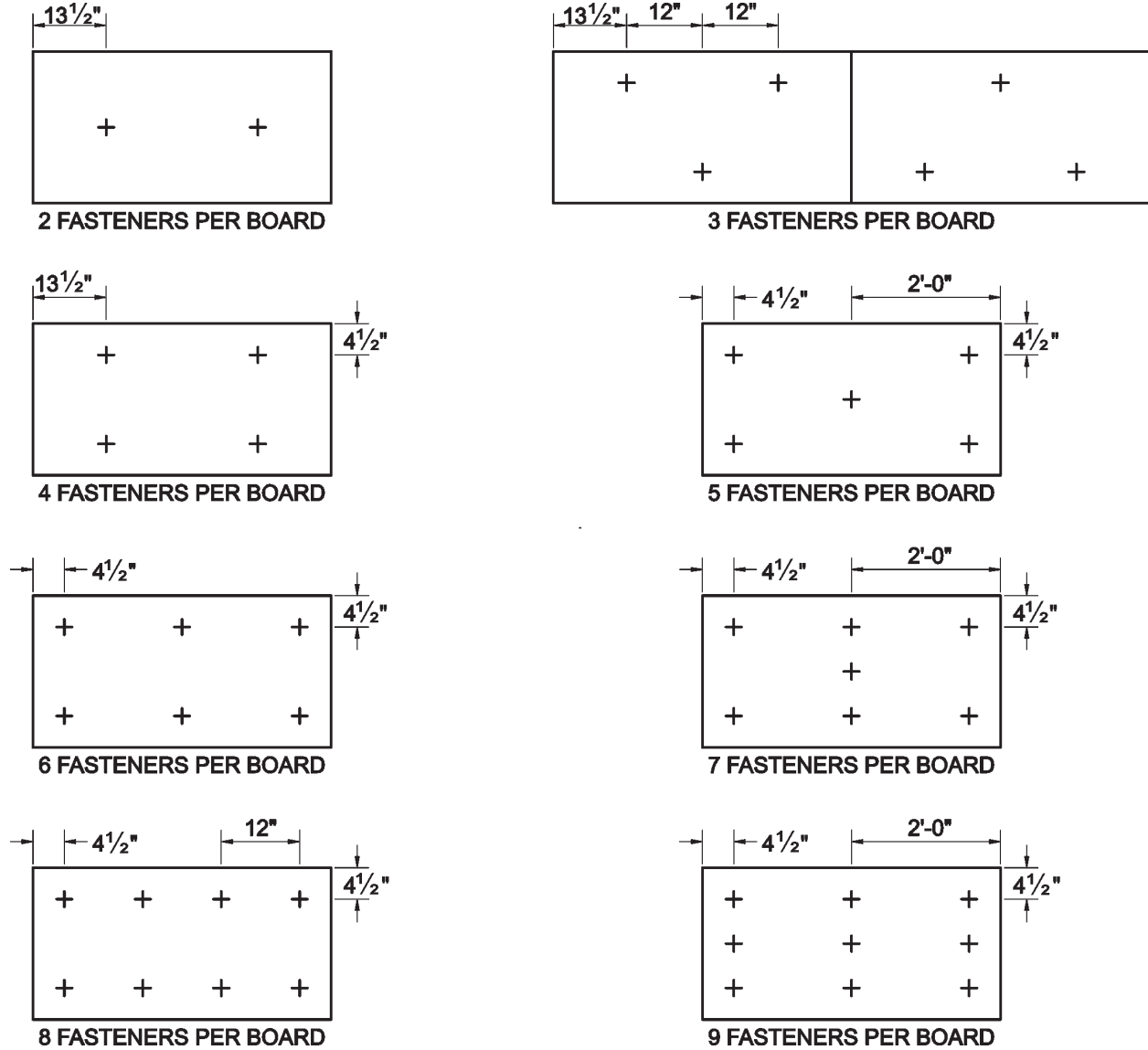


FIGURE 1
FASTENER PLACEMENT FOR 2 FOOT BY 4 FOOT BOARDS

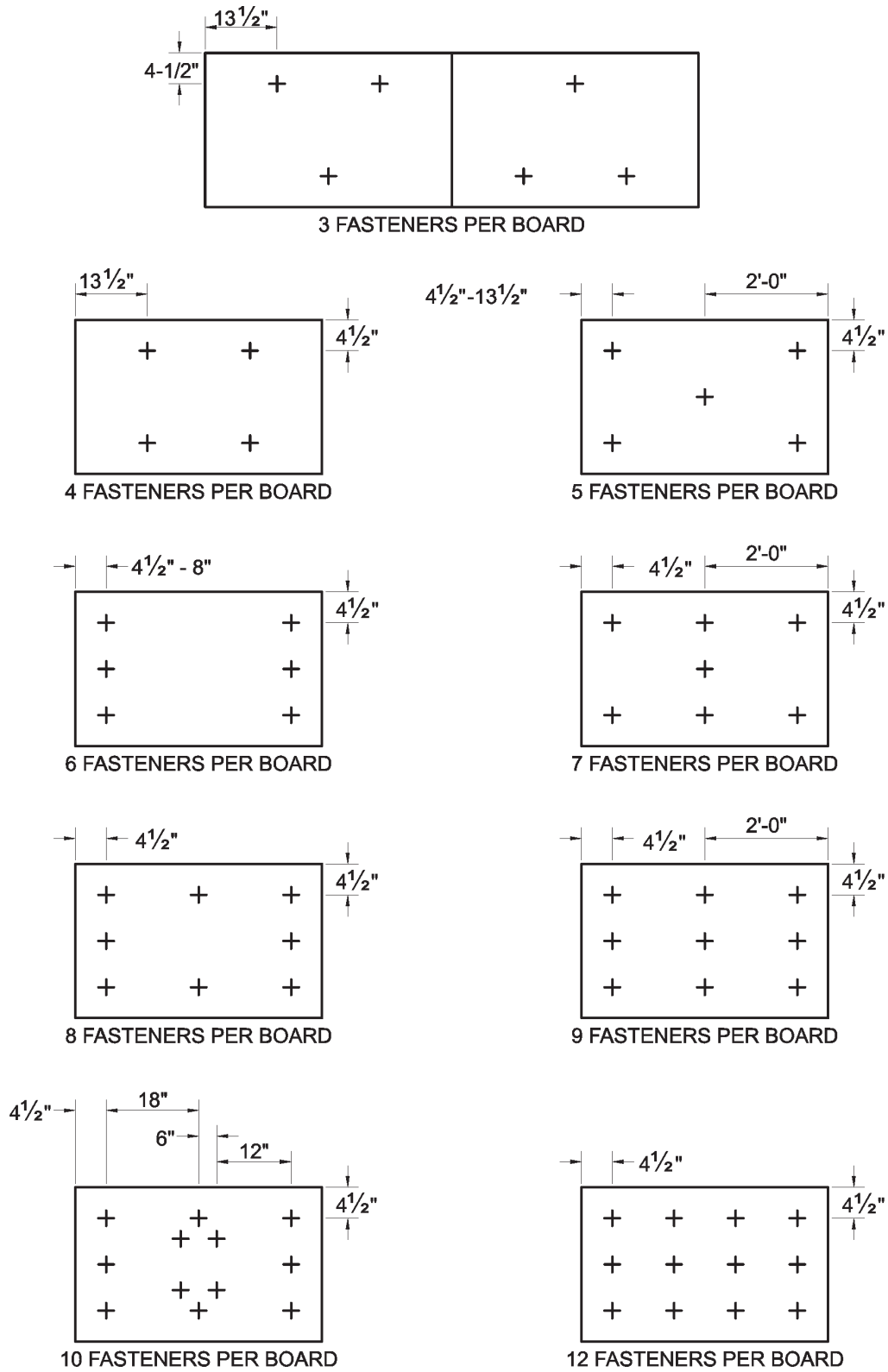
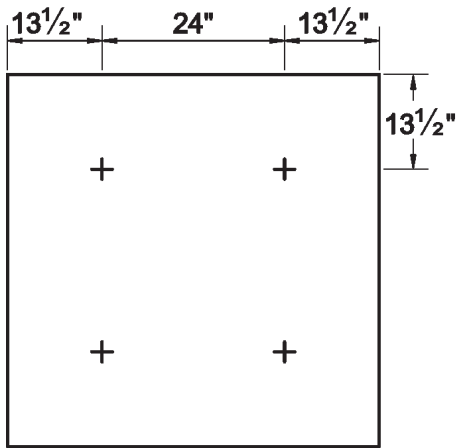
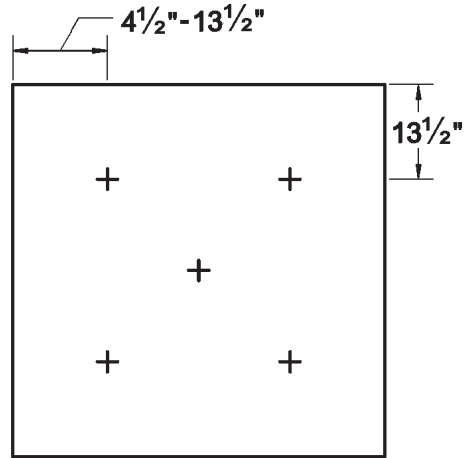


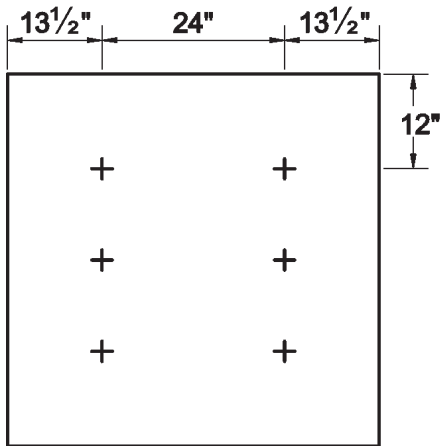
FIGURE 2
FASTENER PLACEMENT FOR 4 FOOT BY 4 FOOT BOARDS



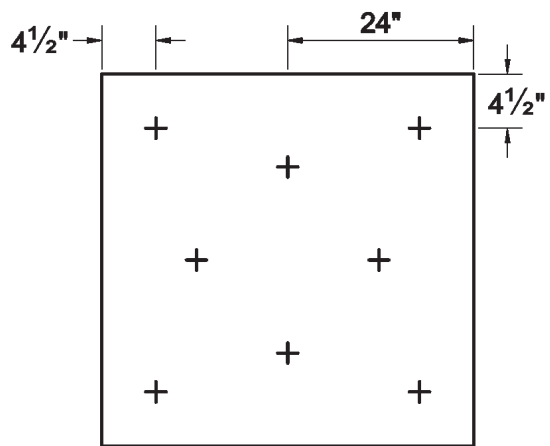
4 FASTENERS PER BOARD



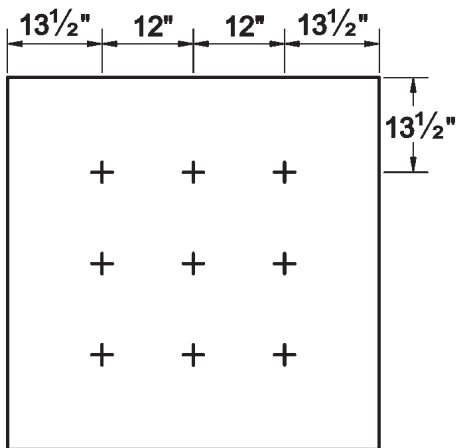
5 FASTENERS PER BOARD



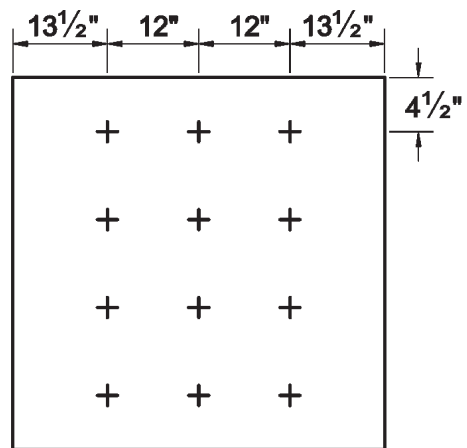
6 FASTENERS PER BOARD



8 FASTENERS PER BOARD



9 FASTENERS PER BOARD



12 FASTENERS PER BOARD

FIGURE 3
FASTENER PLACEMENT FOR 4 FOOT BY 4 FOOT BOARDS

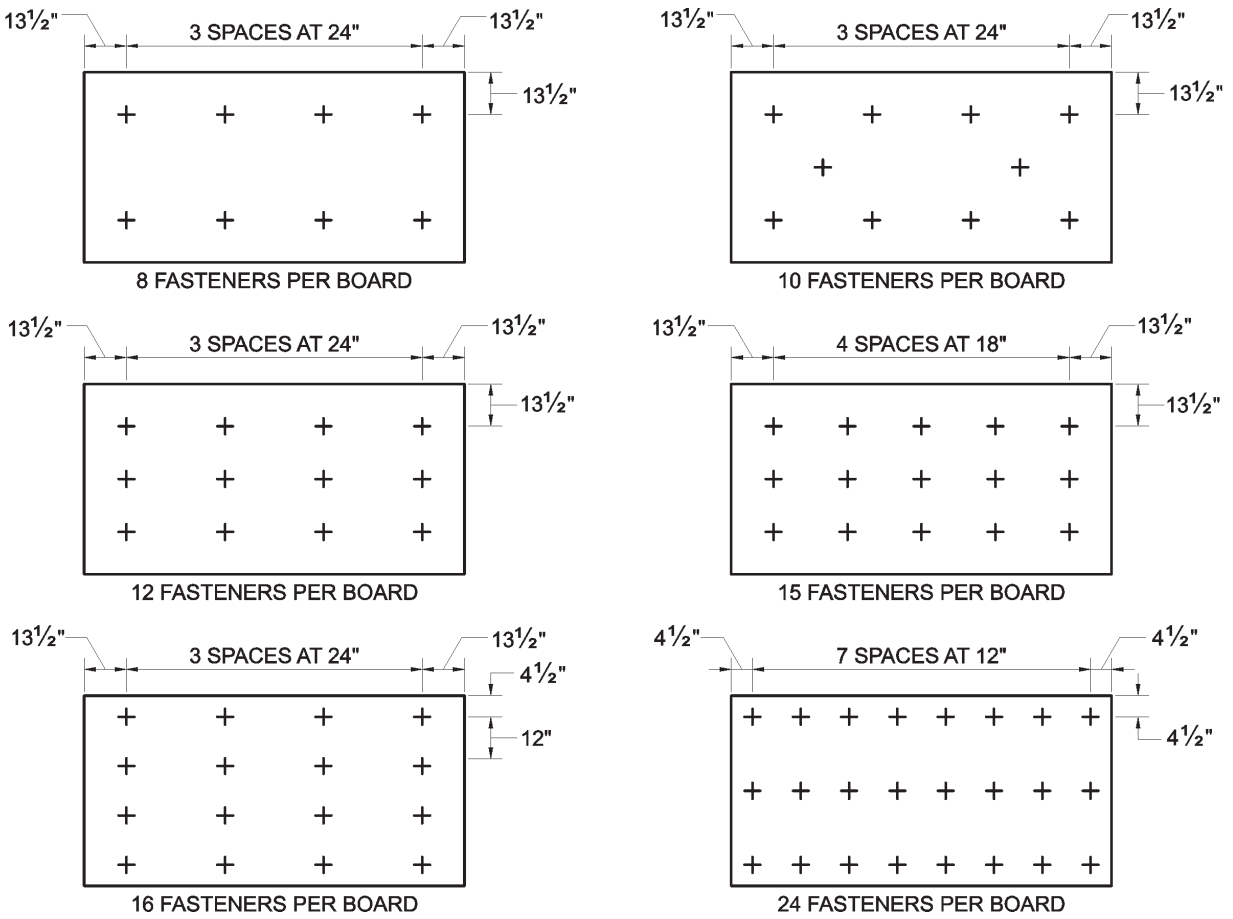


FIGURE 4
FASTENER PLACEMENT FOR 4 FOOT BY 8 FOOT BOARDS

